NAMES _____ _____
(*Prior coordination with me is required if more than two of you work together on this project*)
Section: _____
Physics 315
Problem Set 5
100 points
Due: *Beginning of class*, Lesson 42

To receive full credit you must show all work, communicate efficiently using proper grammar, and for every short answer (e.g. yes, no, maybe, it depends, I don't know) include an explanation why. On all answers requiring calculations, SHOW YOUR WORK.

AUTHORIZED RESOURCES: *any published or unpublished sources and any individuals*.

Document appropriately! _____

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1. Explain why the RHAW (radar homing and warning system) on a Wild Weasel is like a phased array in reverse. A common weasel tactic is called "sniffing." While sniffing, a Weasel normally flies very low to the ground, but occasionally zooms up above the highest terrain in the area to collect signals. It then dives back toward the low level arena, only to repeat the zoom/dive maneuver numerous times before popping the threat radar with a HARM. Explain this tactic, both in terms of offense and defense for the Weasel (make sure you explain why the Weasel would want to do that phased-array-in-reverse thing from more than one location while trying to locate the same threat radar).

2. Almost any aircraft you will go on to fly will carry some sort of jamming device, whether an internal jammer like the F-15s ICS or an externally mounted device such as the ALQ-181 pod carried by Vipers and Weasels. These pods contain multiple transmitters and antennae and use a variety of ECM techniques to help to increase the miss-distance of many types of surface-to-air and air-to-air threats. Explain how a velocity gate stealer is different from a range gate stealer. What do they do? How do they work? How are they best defeated?

3. A certain crystalline substance is found to be a good electrical insulator at 0 degrees Celsius, but when the temperature is increased to 100 degrees Celsius, it readily conducts electricity. Explain this observation (rough sketches of energy diagrams overlaid with electron occupation probabilities should be included in your answer). If the peak radiated energy from the hot tailpipe of a jet engine occurs at a wavelength of about 3-5 microns, what bandgap (expressed in electron-volts) would you choose for a missile seeker's detector. Electrons in a semiconductor at room temperature has an average thermal energy of about 0.025 eV. The AIM-9P variant of the Sidewinder missile does not include an argon bottle, while the AIM-9M does. How do the previous questions and statements let you know which missile is more capable? Why?

4. There are a multitude of facets to a stealthy design. Discuss the three major thrusts of stealth research discussed in class, including in your discussion a description of the physical processes targeted by the research. In our discussion of solid state missile seekers, we only used two bands (the valence and the conduction bands) to completely describe the basics of IR detection. In our discussion of radar absorbing materials, we needed at least three levels to do the trick. Why was this extra level crucial to stealth?